MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

Food Additives and Contaminants Committee

Report on Azodicarbonamide

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Food Additives and Contaminants Committee

The terms of reference of the Food Additives and Contaminants Committee are:

To advise the Minister of Agriculture, Fisheries and Food, the Secretary of State for Scotland, the Minister of Health, and as respects Northern Ireland, the Secretary of State for the Home Department, on matters referred to them by Ministers, in relation to food contaminants, additives and similar substances which are or may be present in food, or used in its preparation, with particular reference to the exercise of powers conferred on Ministers by Sections 4, 5 and 7 of the Food and Drugs Act, 1955 and the corresponding provisions in enactments relating to Scotland and Northern Ireland.

The members of the Food Additives and Contaminants Committee are:

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Joint Secretaries

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T. J. COOMES, ESQ., B.SC.

Pharmacology sub-Committee

The terms of reference of the Pharmacology sub-Committee are:

To advise at the request of the Committee on Medical Aspects of Food Policy, the Food Additives and Contaminants Committee, the Ministry of Agriculture, Fisheries and Food, the Ministry of Health, the Scottish Home and Health Department, or the Ministry of Health and Social Services, Northern Ireland, on the hazard to health, including toxicological and carcinogenic risks, resulting from the use or presence of additives or contaminants in or on food.

The members of the Pharmacology sub-Committee are:

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FOOD ADDITIVES AND CONTAMINANTS COMMITTEE

Report on Azodicarbonamide

Remit

1. We were asked to consider an application for azodicarbonamide to be added to the list of bread improvers permitted in the Bread and Flour Regulations 1963. The Pharmacology sub-Committee and their predecessor the Pharmacology Panel were also asked to consider the toxicity of azodicarbonamide.

The application

2. The applicants summarised their case as follows:

"In view of the great change in baking technology, scarcely known in 1960, there is now a need for fast working improvers since long fermentation of dough which has so far been the usual procedure, is now rapidly being superseded. One such fast acting and safe improver is azodicarbonamide which is needed under the changing conditions in the baking industry.

Considerable work has been done on the use of this improver and extensive evidence is available as to its safety and harmlessness with respect to health".

3. The application referred to the statement by the Preservatives sub-Committee in paragraph 59 of their Report on Flour Improvers [Appendix V to the Food Standards Committee's Report on Bread and Flour (HMSO 1960)] that "the number of substances employed for the treatment of flour should be kept to a minimum consistent with technological needs and that no new chemical treatment should be permitted until it had been adequately tested and officially approved. The position should be reviewed as new evidence becomes available and in any case in 3–5 years time".

4. The application gave the comparative rates of treatment for modern dough processes as:

Azodicarbonamide	15–25 ppm.
Ascorbic acid	70–100 ppm.
Potassium bromate	70–100 ppm.
Ammonium persulphate	100–150 ppm.

5. We considered written evidence and took oral evidence from the applicants. We consulted the Flour Milling and Baking Research Associations and the Baking Industry.

Safety of Azodicarbonamide

6. The Pharmacology sub-Committee in its first report dated October, 1965 (Appendix I) said that none of the evidence so far submitted indicated that the use of azodicarbonamide as a flour improver was likely to present a hazard to health but that full clearance could not be given until satisfactory results were available from long-term studies on a species in addition to the rat. The sub-Committee has since examined a report from the Toxicology Unit, Department

of Medical Biochemistry and Pharmacology, University of Birmingham, entitled "Studies on the Biological Effects of Biurea and Azodicarbonamide in Mice" and has agreed there is now no toxicological objection to the use of azodicarbonamide as a flour maturing agent at levels not exceeding 25 ppm in the treated flour.

7. The Joint FAO/WHO Expert Committee on Food Additives considered the safety-in-use of azodicarbonamide at the Ninth Session in Rome, during December 1965. It concluded that the doubts about the possible effect of unconverted azodicarbonamide had been cleared by short- and long-term studies using over-treated flour, or bread which had been made from such flour. The evidence strongly suggested that azodicarbonamide was rapidly and completely converted on wetting to the metabolically inert biurea, a substance which is stable in bread and of low toxicity and which presents no carcinogenic hazard. The Expert Committee concluded that azodicarbonamide itself was similarly free from carcinogenic hazard and recommended an acceptable treatment level of 0–45 ppm.

8. We accept that azodicarbonamide used as a flour maturing agent at levels not exceeding 25 ppm of treated flour is unlikely to present a hazard to health.

Need for Azodicarbonamide

9. Four main points were made by the applicants to substantiate the need for the use of azodicarbonamide:

(a) the intermediate proof stage in the bread-making process was unnecessary;
(b) the amount of flour improver used was reduced;
(c) more home grown wheat could be used;
(d) azodicarbonamide was cheaper than alternative comparable flour improvers.

10. We asked for the views of the Research Associations and of the four main bread manufacturers on the advantages claimed for azodicarbonamide. The general view was that so long as ascorbic acid and potassium bromate were allowed there would be no significant advantage in permitting azodicarbonamide. The Research Associations drew attention to a disadvantage of azodicarbonamide compared with ascorbic acid and potassium bromate. The level of azodicarbonamide used was said to be more critical and required more careful control; moreover the deleterious effects on dough and bread quality resulting from an overdose were more serious than those which resulted from any over-treatment with ascorbic acid or potassium bromate. It would be necessary therefore to apply special tests to determine the optimum level of azodicarbonamide for each flour.

11. We were provided with supplementary evidence on this point by the applicant. We were told that there had been no evidence during the long use of azodicarbonamide in the U.S.A. that difficulties did in fact arise in practice.

12. We also enquired whether there was any effect on the moisture content of the bread when azodicarbonamide was used. The applicants carried out experiments which showed that the moisture content of bread made when

using azodicarbonamide might be a little higher (e.g. ½–1 %) but they informed us that this had no perceptible effect on keeping qualities or on development of mould.

13. It is common ground that azodicarbonamide would not be satisfactory for use in bulk-fermentation bread-making processes or for baking biscuits, cakes and flour confectionery. If azodicarbonamide was permitted as a flour improver, it would probably be added to flour by millers and there would be at least a possibility that this would increase the difficulty in obtaining flour suitable to the needs of the small bakers who are not equipped to use the mechanical accelerated dough development process. We would be concerned at such a development.

14. Although the applicants claimed that the use of less azodicarbonamide and the elimination of the intermediate proof stage provided savings in production costs, these would not appear to be regarded as significant by the industry. The ability to use home-grown soft wheat is, of course, conferred by the mechanical accelerated dough development process and not by the particular improver used.

15. Our conclusion is therefore that on the present evidence the case for the immediate need for azodicarbonamide has not been established to our satisfaction.

Recommendation

16. We have carefully considered all the relevant factors in deciding whether to recommend that azodicarbonamide should be added to the list of permitted improvers. We have had particular regard to the view of the Preservatives sub-Committee quoted in paragraph 3 above and to the view of the Food Standards Committee in paragraph 59 of their Report on Bread and Flour that it is necessary to be particularly careful about the ingredients of bread because it is the most important staple food. Although the safety of azodicarbonamide has now been established at the levels at which it is technologically useful, we consider it essential to evaluate the relative advantages and disadvantages of all the permitted improvers and of any others such as L-cysteine which, like azodicarbonamide, are not permitted at present. This could only be done in the course of a full review of the Bread and Flour Regulations, particularly as the advantages claimed for azodicarbonamide are not clear cut and have not commanded support from the potential users. We cannot, therefore, at this stage, recommend that azodicarbonamide should be permitted.

17. We consider that this Report should be made available now in order to assist all concerned in giving full consideration to the use of flour improvers in the period before the review of the Regulations takes place. *We recommend* accordingly that azodicarbonamide should not be allowed at present but that the need for it should be reconsidered when the Regulations are reviewed. We understand that this is likely to take place in 1969.

April, 1968

First Report of the Pharmacology sub-Committee

1. We have continued the study which was initiated by the former Food Additives and Contaminants sub-Committee and its Pharmacology Panel. We received two volumes of detailed evidence from Wallace and Tiernan Ltd. which included information on:

(i) the chemical and physical properties of, and specification for, azodicarbonamide;

(ii) two-year feeding studies, in rats and dogs, in which bread comprised 80 per cent of the diet. Animals were fed bread made from flour treated with 10 times the normal level of azodicarbonamide (i.e. 10×10 ppm—which was the highest level practicable); and with diets containing bread made from untreated flour but supplemented with biurea (to which azodicarbonamide decomposes during the bread-making process) at levels of 750, 3,750 and 7,500 ppm, i.e. amounts of biurea equivalent to those that would remain in bread after treatment with 100, 316 and 1,000 times the normal use level of azodicarbonamide. The rat tests included reproduction studies extending into the third generation;

(iii) one-year studies on rats and dogs fed high levels (5 per cent and 10 per cent) of biurea in the diet;

(iv) a rat metabolism study using biurea tagged with C^{14} and an *in vitro* study of the effect of simulated digestive juices on biurea;

(v) a study of the effect of azodicarbonamide treatment on the amino acids of wheat gluten and on the thiamine, riboflavin and niacin content of natural and enriched flours.

[NOTE: The information in items (ii) to (v) has now been published—Oser, Oser, Morgareidge and Sternberg; Toxicology and Applied Pharmacology, 1965, 7, 445.]

2. We asked for and obtained supplementary information on the acute toxicity of azodicarbonamide (to mice, rats and dogs) and on dermatological tests with and experience of the handling of flour containing azodicarbonamide. We also asked for and obtained supplementary information on the time sequence of the incidence of histo-pathological findings in the two-year rat study so that we could better assess the significance of these findings as regards carcinogenicity.

3. Extensive toxicological evidence has been submitted in support of the application to use azodicarbonamide as a flour improver. Nevertheless our full requirements have not been met since adequate long-term studies have been made on one animal species only, namely, the rat. We understand however that long-term studies on mice are in progress.

4. In our opinion none of the evidence so far submitted indicates that the use of azodicarbonamide as a flour improver is likely to present a hazard to health; but we cannot unreservedly give clearance to its use until satisfactory results of long-term studies on a species in addition to the rat are forthcoming.

October, 1965

Information and/or representations, oral and written, have been received from the following organisations and other interests concerned with the use of azodicarbonamide.

*Wallace & Tiernan Ltd.
British Baking Industries Research Association
The Research Association of British Flour Millers
(These Associations have been amalgamated as the
Flour Milling and Baking Research Association)
Allied Bakeries Ltd.
Co-operative Wholesale Society Ltd.
Joseph Rank Ltd.
Spillers Ltd.

*Gave oral evidence

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